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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

FOREST RESEARCH ACTIVITIES

FOREST MANAGEMENT
WATERSHED MANAGEMENT
FOREST PRODUCTS

FOREST ECONOMICS
RANGE MANAGEMENT
FOREST SURVEY

M—5105 (Rev. 1936)

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FOREST RESEARCH

MONTHLY REPORT

February, 1937

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FUNDAMENTAL RESEARCH

(From the "Industrial Bulletin" of Arthur D. Little, Inc., No. 116, September, 1936.)

Among the notable papers of the Chemical Engineering Congress held this summer in London was one by Dr. C. M. A. Stine, formerly Chemical Director and now Vice-President of E. I. du Pont de Nemours & Co., Inc. His subject was the place of fundamental research in an industrial research organization as based upon the experience of initiating a fundamental research program and administering it over the past nine years.

Starting with the definition, "Fundamental research is a quest after facts about the properties and behavior of matter, without regard to a specific application of the facts discovered," he contrasts therewith pioneering applied research and applied research, in order to arrive at a constructive classification of research activities based upon purpose rather than upon the nature of the work. The purpose of fundamental research in industry is to create new fields, to promote a basis for future processes and products. In contrast with this the function of pioneering applied research is to enlarge or expand existing fields.

By way of illustration he takes the case of a company engaged in a manufacture which employs derivatives of cellulose. Such an enterprise would properly regard research on the structure of cellulose as fundamental, while an undertaking to develop a new derivative with a view to definite uses for the product would belong to the field of pioneering applied research. The actual manufacture of the new derivative would involve the ordinary problems of industrial or applied research.

Recognition is given to seven advantages accruing to the company underwriting a fundamental research program, with a word of warning as to the conditions found to be essential for success. "Without reservation it can be said that a sympathetic administrative attitude is basically important." A corollary to this postulate is that a program of fundamental research should be underwritten for a period of years rather than carried forward on a year-to-year basis. While recognizing further the importance of proper conception, he lays most emphasis upon the importance of personnel. "The secret of success is to secure for fundamental research the highest grade of men obtainable for each of the principal lines of work and then turn them loose." In the words of another, men are required who can function under the general order, "Go as far as you can see, and then see how far you can go!"

Through a properly formulated and administered program industry can realize the following advantages from fundamental research:

(1) Provide a basis for future processes and products, so that an industry may grow from within rather than merely expand by imitating other industry.

(2) Solve the more difficult or complex "practical" problems by an approach other than by empirical methods. Many problems of engineering design are of this complex type.

(3) Assure continued leadership in quality and economy of production by unremitting study of existing products and processes.

(4) Create within an industry specialists who are available for consultation on problems of applied research.

(5) Broaden and strengthen relations between an industry and the university research workers.

(6) Attract to an industry those university graduates who have a distinct aptitude for research but who would not be happy in the ordinary applied research laboratory.

(7) Provide an outlet within an industry for workers in applied research who develop a distinct aptitude for fundamental research.

After appraising the accomplishments of the du Pont plan through a review of several broad headings under which the work was organized, Dr. Stine discusses the atmosphere in which fundamental research should be conducted in a manner that would be of interest to directors of industrial laboratories, "I am convinced that the drive and intense activity that characterize the business atmosphere and very real incentives for achieving results in a relatively short time."

An established industrial enterprise, financially able to sustain a program of fundamental research and administratively able to support such an activity, may find sufficient inspiration for going ahead in recalling the origin of the home radio set. Certainly neither Herz nor Maxwell, as Dr. Stine states, foresaw such an article in their early work on electromagnetic waves. Radio manufacture is indebted to these men and to the later fundamental workers in the field of electronics for its being.

Corporation executives responsible for the research function and certainly directors of the larger industrial research laboratories should read Dr. Stine's address with care. A limited number of copies are available to readers of the Industrial Bulletin who are interested, or they may be obtained directly from the Office of the International Secretary, Chemical Engineering Congress of the World Power Conference, 36, Kingsway, London, W. C. 2, England.

GENERAL

Appalachian

Personnel. Dr. W. E. McQuilkin, formerly of the Resettlement Administration, Lincoln, Nebraska, and Albert S. Downs of the Allegheny Forest Experiment Station, Philadelphia, Pa., were transferred to the Appalachian Station. They have been assigned to the Oak-Pine type management project.

Northeastern

Personnel. I. H. Sims was transferred from the Division of Silvics in Washington to the Northeastern Station early in February. Sims will have charge of planting investigations in the Northeast.

A. P. Jacot, a specialist in biology of the soil, who has been at the Appalachian Station for about two years, has been given a permanent appointment at the Northeastern Station.

Pacific Northwest

Personnel. Elbert H. Reid, Junior Range Examiner, is a new appointee of the Range Research staff. Mr. Reid specialized in grazing studies while taking advanced work at the University of California, and comes to the Station from the Snoqualmie National Forest where he was occupied in range surveys.

Rocky Mountain

Lodgepole Pine Experimental Forest. An area has been selected by the Station in cooperation with the Regional Office for a lodgepole pine experimental forest and plans are being made to recommend its being designated for this use. The tract embraces a complete watershed on the Arapaho National Forest and will be suitable for work both in silviculture and watershed management. All species found in the lodgepole pine type are represented as well as large bodies of Engelmann spruce and of high elevation grassland. Research in forest influences on this high elevation, west slope drainage is urgently needed and investigations in lodgepole and Engelmann spruce cutting methods must be begun at once. A ranger station on the area, now seldom occupied, can be used temporarily for headquarters.

Southern

Swedish Views on American Kraft Pulp Production. Mr. A. Wallenberg, a sawmill and pulp mill industrialist from Sweden and formerly

Southern (Continued)

Ambassador to Washington, who is investigating the expansion of the kraft pulp and paper industry in the South, spent a short time discussing the situation with Captain Eldredge. Mr. Wallenberg, who had already talked with Demmon and men at the Washington office, was chiefly concerned with the possible effect of the market expansion for Swedish pulp in this country. He stated that the use of kraft board containers in Europe is increasing and might ultimately make up for a loss in American trade; but that an abrupt loss of the American market would be a serious stroke. Swedish pulp mills would undoubtedly fight for the market, however, he said, by reducing their kraft prices to meet southern competition. Mr. Wallenberg said that in Sweden the production of pulpwood is considered more profitable than the production of sawtimber, and expressed the opinion that we might ultimately find the same to be the case in the South. He felt that prices paid for pulpwood in the South are far too low and that, as competition grows, the price will increase to something approximating the intrinsic value of the wood.

FOREST MANAGEMENT

SILVICULTURE

California

Natural Reproduction - Pine. Comparison of site factor station records at Stanislaus Branch for the period May 1 to Nov. 30, 1936 shows the following relationships between aspects and cutting to different degrees.

	North aspect Sp-WF type			South aspect PP-SP type	
	Clear	Partial	Virgin	Clear	Virgin
Tot. hours air above 40°F	3892	4607	4442	3981	3852
" " soil (1/4 in.) above 120°F	291	48	-	442	-
Tot. hours soil (1/4 in.) above 130°F	65	-	-	188	-

The clear-cut areas and south exposures show the usual great fluctuations in air and soil temperatures.

Heat killing of seedlings was again negligible although seedlings of the current year 6 weeks after germination experienced internal temperatures from 119°F to 133°F when the surface soil ranged from 121°F to 141°F. Seedlings from seed sown in the fall, and natural seedlings, usually are about two months old before the highest temperatures occur and seem to escape damage.

Central States

Missouri Defect Study - Upland Oak. The report by Limstrom and Kuenzel now nearing completion, has been summarized as follows:

(1). Analysis of data collected on fifteen clear-cut plots in upland hardwoods of the Clark National Forest Purchase Unit in Missouri disclosed a loss of 31.6 percent of the total board foot volume in trees over 9.6" d.b.h.; 11.1 percent was attributed to decay associated with fire scars, and 14.6 percent to decay associated with branch stubs. For trees less than 9.6" d.b.h. the loss was 8.2 percent of the total merchantable cubic volume in small poles, and 9.6 percent in large poles.

(2). Sixty percent of all trees analyzed were defective from one or more causes.

(3). About twice as many trees in the stands were defective as the number detected by careful observation of external indications.

(4). Sixty percent of all trees analyzed were injured by fires; about sixty-eight percent of the trees injured by fire were defective.

(5). More than ninety-seven percent of the branch stub decay was found associated with stubs over two inches in diameter.

(6). About sixty-eight percent of the trees having branch stubs over two inches in diameter were defective.

(7). The extent of branch stub decay appeared to vary directly as the age of the stand and inversely as its density.

(8). Fire scars and branch stubs over two inches in diameter were found to be the most common points of entrance for decay organisms. A large number of fungi caused the decay.

(9). Although the actual amount of defect attributed to insects was small, the role played by these organisms in hastening decay is not yet fully determined.

(10). Defect is so prevalent in both young growth and older stands of the Missouri Ozarks that its extent should be carefully determined in the formation of management plans and the performance of cultural operations.

(11). This preliminary study reveals the serious effects of repeated burning and destructive logging in upland hardwoods of Missouri, and indicates the need for intensive fire control measures.

Northeastern

Symbols for Mapping Eastern Forest Types. Reineke has developed a legend for the Society of American Foresters' official list of 97 forest cover types for the eastern United States, which appears to fill the need for standardization of type map symbols. The legend is flexible, so that the detail of large-scale maps may be condensed for small scale maps without change in basic color combinations.

The legend is made up of two-color symbols throughout, consisting of colored lines on colored backgrounds. The choice of colors and line patterns follows a systematic plan whereby each symbol has a significance beyond the immediate type number assigned to it. For example, any two-color symbol denotes a forest type (non-forest types to be shown by single color symbols); any green background indicates "Northern Forest"; a yellowish-green indicates a dry-site type and a deep green indicates a wet-site type in the northern forest. In the same manner, blue and green lines, superimposed on the background color, indicate coniferous types and red, yellow, and brown lines indicate hardwood types. Additional information is shown by the character of lines used. A descriptive article is being prepared for the Journal of Forestry.

Girdling Experiments. Experiments in poisoning undesirable trees, initiated at the Gale River Experimental Forest in 1933, met with varying success. It was found that sodium arsenite in strong enough solution kills the stems of trees but not the root systems of some species, permitting suckering or the production of basal sprouts. Girdling proved more effective than poisoning in killing the root system as well as the portions of the tree above ground.

Further studies were initiated in the fall of 1935 to determine the effect of season of the year at which girdling is done, upon subsequent root suckering of aspen and associated species. Six treated plots were established in different seasons:

September 5	approximate end of active growing season
November 15	early part of dormant period
January 27	period when hexoses have probably reached their maximum amounts and starches are at lowest ebb
April 20	catkins beginning to develop
June 13	active growing season

These treatments produced no apparent effect on vigor during the summer but foliage of the girdled trees turned yellow or fell about two weeks earlier than on the check plot. No differences were noted on plots treated between September and April, but the plot girdled in June retained its leaves about a week later than the other treated plots.

Northern Rocky Mountain

Damage and Mortality from Freezing. November examinations of two plots established during May, 1936, in the vicinity of Lookout Pass near Mullan, Idaho, to study the effects on western white pine of the sudden drop in temperature experienced throughout the Northern Rocky Mountain region in October, 1935, indicate that little mortality has resulted. The plots were established in areas of greatest observed damage. One hundred western white pine trees were tagged on each area and observations of mortality, tree vigor, foliage characteristics, and height growth were made for each tree.

Following is a summary of the more important November observations:

	Percent of trees by vigor classes			
	Poor vigor	Fair vigor	Good vigor	Mortality
	percent	percent	percent	percent
Plot in 20-year-old plantation - Rainy Creek, Montana	76	23	1	0
Plot in 35-year-old natural stand - Larson, Idaho	74	26	0	1

Only one tree of the 200 trees observed was found dead. This one death was attributed to freezing effects. Nevertheless, though mortality has not been great, growth has been reduced. This will probably continue until the foliage is built up to full density, and vigor of the trees is restored.

Pacific Northwest

Selective Cutting Study to be Started at Pringle Falls. Plans are well under way for the sale of 520 acres of ponderosa pine on the Pringle Falls Experimental Forest, which will amount to approximately 4,000,000 board feet. The sale will constitute a study of selective cutting in the ponderosa pine type and will include seven different systems of cutting that will remove from the forest amounts varying from 20 to 80 percent of the existing stand.

Rocky Mountain

Black Hills Ponderosa Pine Yields. As management plans for several working circles in the Black Hills are due for revision new data on rates of growth are being furnished the regional office as fast as possible. Preliminary figures indicate a net growth rate varying from 58 to 71 board feet per acre annum with an average of about 66 feet net growth. This is considerably lower than previous work indicated but final results of the growth and yield study may raise this

Rocky Mountain (Continued)

figure slightly. Mortality per acre per year averages about 23 feet B.M. which corresponds well with mortality figures for ponderosa pine in other regions. New volume tables for the Black Hills, recently constructed, give results that are 10 percent lower than the old ones. This combination will result in lessening the expected annual cut in the Black Hills but it only confirms the opinions of forest officers who have been watching the development of areas cutover 35 or 40 years ago.

Marking Timber by Tree Classes. Several tests have been made of a possible improvement in marking lodgepole pine and Black Hills ponderosa pine by the use of a tree classification. Marking can be systematized and made easier by its use but the improvement in results in the Black Hills will not be great. In lodgepole pine stands, however, the tests show that in many instances the composition of the residual stand can be greatly improved genetically and with respect to growth rate without lessening the present cut materially. The resulting stand at the end of a cutting cycle would probably have at least 800 feet B.M. per acre more than it would by the present system of marking, and it would be composed of a much larger percentage of the most vigorous trees. By continued use of the classification an improved marking system should develop a stand of the fastest growing and most vigorous strains of lodgepole pine.

Southern

Pond Drainage and Stand Improvement. The pond type is scattered throughout the flatwoods of the Southeast, constituting more than one-third of the total surface, over large areas. The typical pond ranges in size from a fraction of an acre to the Okefenokee Swamp of south Georgia, the larger ponds being locally called swamps. Cypress has been repeatedly culled over, and slash pine either has been or is being worked for naval stores. Current annual increment is practically negligible, and takes place mainly on undesirable hardwoods. Reproduction of black gum and pond cypress is abundant, whereas slash pine reproduction is almost entirely absent. It is essential that this type be kept productive. Local drainage--small ponds to a nearby larger pond, etc.---offers considerable promise.

Specific points needing to be studied are: (1) How may the establishment of slash pine reproduction in ponds be encouraged? Can this be accomplished by merely draining off standing water, or must drainage be accompanied by stand improvement? (2) What effect will draining these ponds have on the site index of (a) slash pine and (b) pond cypress? (3) What effect will drainage have on establishment of underbrush? (4) What effect will draining ponds have on the water table in the surrounding higher land?

Southern (Continued)

Two such ponds, totaling 35 acres, have been selected on the Olustee Experimental Forest for intensive study in an attempt to determine what measures are needed to improve the quality of the stand. Each of these ponds was first halved by a log-earthwork dam of sufficient height to maintain the normal height of the water on the one side, whereas the other side was drained by ditches. Each of these treatments in turn was halved at right angles to the dam. On one side the stand was left untreated as a check. On the other side an improvement cutting removed all hardwoods, all but the best-formed cypress, and all poorly formed or washed-out pine without present or reasonably early value for turpentining or sawtimber. There was sufficient slash pine throughout the ponds to insure an adequate supply of seed. Ten permanently staked strips one chain wide were run across these ponds and a cruise was made of these in 1-chain blocks. Each of these 1/10-acre subplots contains, in turn, four milacre quadrats from which all reproduction has been removed to leave a clear field for recording all future reproduction.

REGENERATION

Lake States

Heat Injury. Although it is usually recognized that drought periods are attended by extremely hot weather, mortality in plantations in such years is usually considered to be due to lack of moisture. Computations just completed on the special mortality study made by the Station on the Huron National Forest, however, reveal that heat was more important than drought as a mortality factor during 1936. This is well illustrated by the following table:

Species	Age (from seed)	Causes of Mortality Heat %	Drought %	Other %	Basis Number of Plantations
Jack Pine	2-1/2	74	26	-	10
Norway Pine	7	58	41	1	15

Injury of this kind is evidenced by a discolored ring of "cooked" cambium found on smaller trees (those under 1/2-inch in diameter at root collar) usually about an inch from the soil surface. In a few cases such "dead" trees were found which still had live roots, which would indicate definitely that drought did not cause death. On larger trees heat injury takes the form of lesions on the southwestern side of the trees.

Older Plantations Survive Well. The analysis of data collected in the resurvey of older plantations in the three Lake States is coming

Lake States (Continued)

to a head. This indicates that plantations which reach ten years in age show but little loss during the following ten years. Three hundred eighty plantations averaging 23 years old in 1936 showed a mean loss of only 16 percent in survival during the twelve-year period, 1924-1936 compared with 50 percent mortality during the first eleven years.

This trend is also brought out by studies on the Huron Forest which indicate that under the relatively severe conditions there, Norway pine plantations which are 15 years old suffer little loss, those 10 years old may have noticeable loss, and those under 10 years of age may be severely damaged in drought years.

Northern Rocky Mountain

Seed Fall: Western White Pine. Counts of seed caught in seed traps have furnished a basis for determining the time of dissemination and to some extent the amount of seed produced by the principal species in the western white pine type. On each of two permanent sample plots 16 quarter-milacre seed traps have been in operation for 8 years. Seed falling into these traps has been periodically collected and counted, furnishing a measure of both the time and abundance of seed fall. The following table summarizes records obtained from these plots.

Time of seed fall of principal species in the western white pine type. (300-year old stand, plot 151.)

Time of seed fall	Percent of total seed fall by species					
	Western white pine	Western larch	Douglas fir	Lowland white fir	Western hemlock	Western red cedar
	percent	percent	percent	percent	percent	percent
Midsummer to September 1	14	5	6	1	5	14
September	59	30	22	64	4	16
October	10	31	37	13	43	24
Nov.1 to midsummer of next year	17	34	35	22	48	46
Total	100	100	100	100	100	100
	number	number	number	number	number	number
Average seed fall per acre per year	39,500	45,900	3,000	12,800	956,500	3,003,000

(Cont'd.)

Time of seed fall of principal species in the western white pine type. (75-year old stand, plot 101.)

Time of seed fall	Percent of total seed fall by species					
	Western white pine	Western larch	Douglas fir	Lowland white fir	Western hemlock	Western red cedar
	percent	percent	percent	percent	percent	percent
Midsummer to September 1	17	24	4	8	5	19
September	52	35	74	64	14	19
October	16	19	7	14	49	23
Nov.1 to midsummer of next year	15	22	15	14	32	39
Total	100	100	100	100	100	100
	number	number	number	number	number	number
Average seed fall per acre per year	3,500	17,500	8,800	1,800	3,000	5,000

Western white pine disseminates most of its seed crop in the early fall. Considering both plots, about 15 percent of the current crop is disseminated before September 1 (seed fall ordinarily begins in the last week or two of August) and about 85 percent by the end of October. Incidentally, the relatively small amount of seed falling during the late fall and winter makes it seem rather dubious that any large amount of seed could be widely disseminated by drifting snow. Lowland white fir scatters its seed nearly as promptly as white pine. About 80 percent is released before the end of October; only 20 percent falls during the late fall and winter. Larch and Douglas fir, though rather variable, seem to disseminate their seed about the same time. Seed dissemination begins a little later in the fall than for white pine and white fir, and about 75 percent of the seed crop falls by the end of October, 25 percent falling in the late fall and winter. Seed of western hemlock and western red cedar falls considerably later than that of the other species. The heaviest fall is in October, and 40 to 50 percent of the crop falls after November 1.

The above are average figures for the 8-year period. As might be expected, seed fall by years is quite variable, both by years all species combined and by individual species. In 1933, for instance, seed dissemination of all species was unusually late. A probable explanation is that the ripening and opening of the cones was slow and dissemination of seed consequently delayed by the unusually wet fall of that year. Other factors such as site, aspect, and age of stand undoubtedly affect the time of seed fall.

Northern Rocky Mountain (Continued)

The average number of seed falling per acre per year in the two plots furnishes an interesting comparison between seed production in an old and a young stand. The stand in which plot 101 is located will in all probability become much like the stand represented by plot 151 in due course of time. The same species are found in each. The old trees of plot 151, however, produce many more seed than the young trees of plot 101. Another significant observation is the relatively small amount of cedar and hemlock seed produced by the young stand of plot 101 and the almost phenomenal numbers produced by plot 151 in the veteran stand. Cedar and hemlock, though present in plot 101, are strongly suppressed as is usual in young and vigorous stands, and produce few seed. In plot 151 these species form a prominent part of the stand and produce seed very abundantly.

Pacific Northwest

Stocking in Ponderosa Pine Natural Regeneration. A recent survey by the stocked-quadrat system of 11,500 acres on the Blue Mountain Experimental Forest, part of which is virgin forest and part of which was cut over approximately 15 years ago, shows that 16 percent of the area is in class A (fully stocked) and 43 percent in class D (less than 5 percent stocked). This indicates that stocking is anything but satisfactory on the large area. A careful analysis of these results along with observations taken elsewhere indicate that there are also areas of overstocking. This sometimes occurs in spots and sometimes over wide areas. Therefore, since it is an area of limited rainfall there exists both a problem of overstocking and of understocking. These studies indicate that more information is needed on this problem upon whose solution depends the vigor of the present stand and the success or failure of the second or third crop.

Southern

Seed Studies: Longleaf Pine. Preliminary results bearing on the effect of moisture content, and of mechanical dewinging of longleaf pine seed, upon the keeping quality, have been obtained from the overwinter storage test set up in December 1936. In this test 64 pounds of longleaf seed, fresh from the kiln, were divided into four lots for storage in various environments and containers. Laboratory tests were made of the four lots immediately after preparation, based on 8,000 seeds from each lot. Supplementary tests, based on 250 seeds apiece, were made at the end of 30 days' storage at room temperature in sealed glass jars. All germination tests were run 30 days. The conditions of the seed, and the results of the tests, were as follows:

Southern (Continued)

Moisture content expressed as percentage of dry weight	Condition of wings	Germination percentage from tests set up:	
		Before storage	After 30 days' storage
21.27	Intact	77.3	34.8
9.42	Intact	68.8	66.8
21.59	Removed by dewinging machine	75.6	0.0
8.19	Removed by dewinging machine	65.1	68.0

The striking thing about these results is the excellent germination of the seed as it comes from the modern kiln (at a moisture content of 21 to 22 percent) if sown immediately, coupled with its serious deterioration within one month, unless dried before storage at air temperature. Mechanical dewinging before storage evidently increases the deterioration.

MENSURATION

Northeastern

Growth and Mortality: Northern Forest Types. Analysis of growth data for the cooperative project in Coos County, New Hampshire, indicates a net growth of about 0.2 cords per acre per year in spruce-fir stands, 0.3 cords in spruce-hardwoods, and 0.25 cords in northern hardwoods. Variations in density of stocking seem to have the most marked effect on rate of growth. One point of marked interest brought out in this study is that the mortality in a stand during a period of ten years amounts to three-fourth of the growth put on by the trees alive at the end of the period.

Pacific Northwest

Growth and Mortality: Virgin Douglas Fir. An analysis made of virgin stand growth data from the forest survey of Lewis County, Washington, indicates that in this subdivision gross annual growth of virgin Douglas fir stands (more than 40 inches in d.b.h.) is about 900 board feet per acre on site quality I, 600 board feet per acre on site quality II, and 350 board feet per acre on site quality III. Mortality and decay are so rapid that net growth is practically nil. One of the objectives of selective timber management is to convert gross growth of virgin stands to net growth. Large scale, successful conversion

Pacific Northwest (Continued)

of virgin stands to growing stands through partial cutting remains to be demonstrated in the Douglas fir region, but the above growth rates indicate that there is really something for this type of management to shoot at.

PROTECTION

Fire

Appalachian

Analysis of Weather Factors. There is yet no way of relating the magnitude of the deviations of wind, precipitation, humidity, and other factors from the normal, to the degree of fire hazard in the Appalachian Region. Byram is therefore making an analysis of temperature, wind velocity, humidity, vapor pressure deficit, and precipitation for the month prior to the occurrence of a number of very large fires. The object is to develop a method for currently analyzing the above factors, which in conjunction with the Weather Bureau's fire weather forecasts, will afford a better means of recognizing approaching "blow up" conditions.

Boutwell has begun the preparation of rainfall probability maps for the Station's territory. It appears that the best breakdown may be on the basis of 0.5 inches or more by five day periods.

California

Use of Compressed Air in Fire Suppression. An air-water nozzle, developed by F. C. Lindsay, was tested last summer on the Shasta Experimental Forest as part of the investigation assigned Region 5 by the Spokane Fire Conference. The original apparatus used compressed air alone, and consisted essentially of a 30-inch length of 1" tubing equipped with an air jet. It was intended that the action of the air would rapidly clean a fire line in pine litter or other light fuel. Experiment quickly showed that the excess oxygen supplied the fire retarded suppression and so a nozzle was employed which would mix air and water at the jet.

Tests in the field made at various air pressures and water-flow rates showed that a very definite optimum ratio of these factors existed, in terms of suppression efficiency. Comparison tests conducted with the air-water nozzle and a water nozzle alone showed no advantage in the supplementary use of the air, in all cases except that of mop-up work on logs. Here the air was useful in forcing water into deep cracks.

California (Continued)

The experiments indicated that design and test of nozzles for water alone would result in greater efficiency for this apparatus.

Pacific Northwest

Device for Rating Fire Danger. After conferences with Regional Office men, Matthews and Wilkinson prepared a fire-danger rating board which was the culmination of all the study of fire-danger rating that has been in progress for a year. The board was demonstrated at the meeting of the fire assistants from all forests in Region Six. These men accepted the board as being an essential part of their fire-danger rating scheme. Although many details must still be worked out, nevertheless acceptance of the board as the method of rating and presenting conditions of fire danger means that the results of the study will be applied immediately on the national forests.

The fire-danger rating board provides for the conspicuous display of the current status of all significant fire-danger factors on a ranger district by means of colored disks to represent each class of each factor. Simple integration tables are used to combine factors into one of seven general ratings of "class of day" that are also shown by colored disks. Each class of day is correlated to definite action specified in the fire plan.

Entomology

Central States

Locust Borer. Hall and Secrest made a further analysis of field data from the Carnes Experimental Tract near Cambridge, Ohio. Completion of the summary of survival of locust borer larvae for the 1936 season indicates that there is a close relationship between locust borer survival and elevation of the attack on the tree trunk. This study, based upon 77 trees having a total of 1420 attacks, indicates that on the basal two-foot sections the survival of larvae was 55 percent, while on the two to four-foot sections the survival percent has risen to 65 percent, followed by 77 percent survival in the four to six-foot sections. There is no direct evidence at the present time which would serve to explain the significant difference inasmuch as this difference is exceptionally consistent within each diameter class.

Northeastern

Gypsy Moth. An extensive area heavily infested by gypsy moth has been reported on the outer edge of the Barrier Zone in Fishkill, New York. This report is particularly disturbing since it follows

Northeastern (Continued)

discovery last year of another area of widespread infestation well outside the Barrier Zone in the Catskill region of New York.

Analysis of several stands in the Barrier Zone where infestations have occurred shows that quite generally the understory contains a much lower proportion of favored food species than the main canopy. This strengthens the case for using silvicultural treatment to increase resistance of the forest to infestation and points clearly toward the importance of saving advance growth of unfavored food species in direct control operations involving clean-up of underbrush.

Northern Rocky Mountain

Loss From Beetle Attacks: Western White Pine. Rather severe bark beetle attacks on western white pine stands near Pierce, Idaho, during the past 5 years were very evident from permanent plot measurements recently summarized. As a part of a type-wide study of growth and yield in fully stocked white pine stands, 14 sample plots of approximately one-half acre each were established in 1925 in the vicinity of Pierce and the old Oxford Ranger Station some 12 miles distant. The plots were all located in the same general stand which was slightly over 100 years of age in 1925. The plots were remeasured in 1930 and 1935.

Average volumes on the 14 plots were as follows:

Volume in cubic feet per acre				
Average volume 1925	Average volume 1930	Average net growth 1925-1930	Average volume 1935	Average net loss 1930-1935
13,862	15,375	1,513	14,445	930

During the 1925-1930 period, increment was almost phenomenally rapid, averaging 303 cubic feet per acre per year. During the next five-year period, however, this large net growth was turned into a net loss principally by attacks of Dendroctonus monticolae. The plots lost 930 cubic feet per acre for the period or 186 cubic feet per year. Individual plots lost as much as 2,027 cubic feet per acre during this period.

In interpreting these figures, however, it must be remembered that in most stands total volume increment proceeds somewhat in surges; i.e., there are periods of rapid gain and other periods when on account of heavy mortality or adverse climatic conditions increment is slight or even negative. Growth during the 1925-1930 period was considerably faster than such stands have ever been observed to maintain over an extended period. According to normal yield tables, average increment

Northern Rocky Mountain (Continued)

of fully stocked stands of this age on an excellent site is about 130 cubic feet per acre per year as contrasted to the 303 cubic feet measured on these plots. The stand represented by these plots, though somewhat decimated, is still a good one and in the next 10 years or so may largely recover from the set-back and still show a high average annual increment. The serious loss caused by the bark beetles should not be minimized, but at the same time it must be recognized that few stands escape some reverses during the course of their development.

Southern

Ant Damage in Plantations. Technic for the control of damage to pine plantations (Kisatchie National Forest) by a leaf-cutting ant has been improved this season by the use of a hose and funnel. A weed was found to be a good site index for the ant mounds.

Pathology

Southern

Pine Rust Study. In connection with the establishment of permanent plots to study the effect of Cronartium cerebrum and C. fusiforme on pine, a general survey was started to find suitable areas for this work. Areas of natural loblolly and slash pine reproduction were examined on the Harrison Experimental Forest, near Saucier, Miss. About 10 percent of the trees were found infected with rust galls.

GENETICS

California

The Institute of Forest Genetics has completed surveys of ten prospective sites for transect nurseries at different elevations in El Dorado County. These surveys supply for each site pertinent information on such matters as ownership, personnel available, elevation, soil, water supply and climatological conditions. It is expected that small experimental nurseries will be established this spring at about seven of these places ranging in elevation from about 800 feet up to 6,500 feet.

Last fall seed was gathered from about 275 individual tagged trees of Ponderosa and Jeffrey pines in this same region, and at elevations ranging from 125 feet up to 8,400 feet. The main sowing of this seed will be in a Progeny Test experiment at the Institute of Forest

Genetics, at an elevation of 2,750 feet. In addition, it is planned to sow at each of the transect nurseries a smaller assortment of seed chosen to represent all elevational zones. In this way highly valuable information should result in regard to the adaptability and relative growth responses of the different elevational strains and of the different progenies within each strain.

The work of cleaning the Ponderosa Progeny Test seed has been completed, and data have been recorded showing, for each lot, the amount on hand and the size of the seeds. The size has been obtained by counting the number of seeds in 6 c.c. It has been observed that the seed from any one tree is usually remarkably uniform in size and color, but that seeds from different trees vary greatly in these characteristics. In one case only 52 seeds on Ponderosa pine were required to fill the 6 c.c. measure. Another seed-tree of this species in the same field plot yielded seed so small that 136 seeds were required to fill the same measure.

Likewise, when different cones from the same tree are compared they normally resemble each other to a marked degree, but when cones from different trees are compared they are frequently quite dissimilar in size and general appearance. One Ponderosa seed-tree in El Dorado County produced cones that averaged only 2.6 inches long, whereas another tree in the same field plot yielded cones that were 5.8 inches long on the average. Extreme variations of this type within local strains of a single species are visual evidences of the inherent variability of the plant material with which we are working. Thus it is only natural that we secure striking differences in the nature of the progenies of seed-trees that are growing side by side.

Another phase of the work of preparing for the forthcoming nursery experiments has been the preparation of a master list of all of the Ponderosa and Jeffrey pine seed-tree plots in the El Dorado region. For convenience in use, this list has been arranged in three different ways, first numerically by plot numbers, second alphabetically by plot name, and third, by the plot elevations. This list contains 179 plots of Ponderosa and 19 of Jeffrey pine.

Work has recently started on clearing and grading the land for the new headquarters site at the Institute. This has included the removal of trees, the construction of retaining walls, and the moving of considerable earth. A pump has been installed in the new well and it will not be long before well water will displace ditch water in the Institute's pipelines.

At the Institute of Forest Genetics the two-year old selections from the 1935 breeding nursery were measured, dug and photographed during the past month. Trees assigned to the arboretum were transplanted and material intended for the Fresh Pond field plantation was heeled in on account of snow at the higher elevations.

California (Continued)

The analysis of the Pollination, Progeny Test and X-ray data has continued. Regarding the recurrent problem of reliable means of distinguishing between Pinus ponderosa and Pinus jeffreyi, it has sometimes been considered that the size of the cones could be used as a criterion. The rather extensive data taken on cones gathered in El Dorado and adjoining counties indicate that this criterion is useless if one happens to compare large Ponderosa cones with small Jeffrey cones. The following table, summarized from Progeny Test data on over a thousand seed-trees, recently worked up for the 1934 and 1936 crops, shows clearly that between these two forms there is a very material overlap in cone sizes.

Cone or Seed Size and species (El Dorado Region)	CONE LENGTH		SEED SIZE
	Typical of seed-trees	Extreme individual cones	Av. no. of seeds in 6 c.c. from individual seed-trees
Smallest ponderosa	2.2 in.	1.1 in.	136
Largest ponderosa	6.0 in.	6.7 in.	36
Smallest Jeffrey	4.5 in.	3.4 in.	37
Largest Jeffrey	7.2 in.	8.4 in.	14

From the data on seed sizes which are also given in the above table, and from the records so far collected, there is an indication that the size of the seed is a somewhat better means of distinguishing between these two forms than the size of the cones. It will be observed that a very slight overlap has been recorded, but that it is not nearly so great, proportionately, as that which occurs in the case of cone lengths. The very remarkable differences that exist in the average size of the seed from different seed-trees of ponderosa pine in the El Dorado region is worthy of note.

In its breeding work the Institute of Forest Genetics has discovered that the staminate catkins offer one of the best means of differentiating between the two forms under consideration. The fully developed catkins of ponderosa are normally long and slender, and are of a reddish or purplish color. Those of Jeffrey are typically short and heavy, and are of a yellowish bronze color. The usefulness of this character is handicapped by the short period during which it is available.

Northeastern

Major attention is being devoted to preparation of project plans and organization. Negotiations have been completed for renting the hybrid poplar nursery and field plantings at Rumford, Maine, from the Oxford Paper Company. H. F. Marco and A. G. Snow, Jr. were assigned to the project in January.

Northeastern (Continued)

Marco has devoted most of his time to studying cytological technique necessary for problems connected with progeny tests and breeding. His work has included technique for pollen germination studies, technique for studies of the penetration of pollen tubes through the pistils of tree species, and technique necessary for chromosome studies.

Snow has started studies of vegetative propagation with a rather extensive experiment aimed at developing chemical treatments to stimulate rooting of certain poplar hybrids which cannot ordinarily be reproduced from cuttings. The work also includes chemical treatment of birch, beech, and maple cuttings, in an attempt to induce rooting in these species. Greenhouse space has been rented in New Haven for these experiments.

FOREST ECONOMICS

LAND USE

Lake States

Proposed Woodlot Study. A preliminary study of woodlots made last summer in connection with the Forest Survey shows that economic factors are among the most difficult problems in woodlot management. The organization of the woodlot as a productive part of the farm and the determination of the amount and quality of timber available with the idea of bringing in new industries to provide better markets are fully as important as the technical phases of woodlot management. Such studies may also lead to the ultimate development of cooperative organizations for marketing woodlot products, thus insuring the farmer a larger return from his woodlot. The small returns now obtained are largely responsible for the apathetic attitude toward this important farm resource.

Recreation. An important forest industry which so far has received little consideration from foresters is recreation. In Minnesota this is a ninety-million-dollar industry, and directly employs 22,000 people; in Wisconsin and Michigan it is much larger. Without doubt the recreation industry has exerted a great influence on the local tax situation and has been of great importance in the employment of labor, both of which have been adversely affected by the decline of the lumber industry.

Before an intelligent analysis can be made of either the tax delinquency situation or the status of labor in the lumber industry, we must know:

1. How much have taxes paid by the recreation industry alleviated

local tax problems resulting from forest denudation; and what are the future prospects?

2. To what extent the recreation industry has taken up the slack in unemployment of labor stranded by the decrease in lumbering; what may we expect in the future?

Pacific Northwest

The Problem of Small Ownership. Ownership counts revealed that out of the 716 different private owners in 1932 within a sample forest area in Douglas County, Oregon, 604 held title to less than 320 acres each, this class averaging 140 acres; and another 86 owners held between 320 and 1,279 acres each, averaging 625 acres. Out of 298 owners in Snohomish County, Washington, 247 held less than 320 acres each, averaging 94 acres; and another 30 owners held between 320 and 1,279 acres each, averaging 579 acres. The existence of so many very small ownerships presents a problem in forest organization whether it be for marketing or for continuous production.

Status of Forest Tax Legislation. The Washington bill (H. B. 155) is similar to one introduced two years ago, and provides for the deferment of timber taxes until the accumulated deferred tax on each smallest legal description shall equal 25 percent of the assessed value. It violates the principles of forest taxation as set forth by the Forest Taxation Inquiry because in its operation it would not distinguish between deferred yield properties and those properties which are being liquidated, and because it is optional. It has no scientific basis for its provisions.

The Oregon bill (B.H. 224) provides for the original annual assessment of all timber property by the State Tax Commission and is in harmony with the report of the Governor's special committee on timber taxation and with the conclusions of the Forest Taxation Inquiry. Hearings on the Oregon H.B. 224 were held at Salem before the committees on forestry and assessment, which Munger and DeVries attended. The former appeared in behalf of the bill and presented the conclusions of the Forest Taxation Inquiry in regard to State assessment. Lumbermen's organizations have hesitated to endorse this bill. Some timber owners are wary of asking for special treatment, fearing some sort of retaliatory measures by other interests. Others feel that State assessment might not be as advantageous to them as the haphazard local assessment.

Southern

Drainage and Ad Valorem Tax Study, Mississippi. In his study of the legal aspects and incidence of drainage, levee, and ad valorem taxes on forest land in the Yazoo Delta of Mississippi, Craig has completed abstracts of data from the land-rolls of the 5 counties included

Southern (Continued)

in the study. The complexity of the law governing the operation, administration, and powers of the drainage districts may be judged from the fact that in the 1930 Code the chapter in which all such statutes are contained is comprised of 157 sections. This does not include the numerous acts passed since the codification of the 1930 Code.

The overlapping of taxing districts in the Yazoo Delta Counties is a considerable factor in the confiscatory taxation obtaining on certain properties in the Delta, which in turn leads to increasing tax delinquency and to the failure of forest land operators to consider sustained yield management. The multiplicity of taxing agencies is illustrated by the fact that in one of the smaller counties included in the study, there are 20 drainage districts, 5 major road districts, 4 subroad districts, and 12 school districts. Owing to the overlapping of many of these districts some properties are subject to 2 drainage-districts, 3 school-district, and 2 road-district taxes, in addition to the state and county general taxes as well as the county-wide tax for levee purposes.

LOGGING

Pacific Northwest

Selective Timber Management in Ponderosa Pine. A study of certain phases of the large-scale experimental light cutting which has been under way on the Hines sale during the past few months has been completed. The results are presented in the form of two memoranda, one by Brandstrom and Richen covering the results based on a log grade cruise of the entire 10,000-acre experimental area, and another by Brandstrom and Carlson covering the corresponding results based on detailed log grading on the mill deck of about 7,000 logs. The results, both of the log grade cruise and the log grading done on the mill deck, show on the whole a remarkably close check with the results predicted in the original Hines study report and bring to attention the important economic advantages of the light maturity selection system. Under this system, as predicted in the Hines study report, and as now indicated by a large scale experimental cutting, the net realization per M from the initial cut is nearly twice as high as under the standard 85 percent Forest Service system of selection. Close agreement between predicted and actual results are also shown with regard to stand volume per acre and percentage of total stand volume removed in the first cut.

Southern

Truck Hauling Costs by Log Sizes. For his selective logging study at Crossett, Arkansas, Reynolds has compiled costs of hauling pine logs with trucks for a distance of 4 miles and for each additional 1/2 mile of distance. The costs per M board feet by the International 1/4-inch kerf, the Doyle-Scribner, and the Scribner Decimal "C" scale rules and per 100 cubic feet were computed by log size classes after the loads had been grouped into classes based on the size of the average log for each load. Results are given in the following tables:

Southern (Continued)

LOG HAULING COST BY LOG SIZE FOR 4.0 MILE HAUL

Log Size Int.¼" Scale	Basis No. Loads	No. of logs per load	Volume Per Load				Time in Minutes Per Load					Cost Per M Bd.Ft.			Cost per 100 cu.ft.
			Int.¼" Kerf Scale	Doyle-Scrib. Scale	Scrib. Dec."C" Scale	Cubic Measure	Locate set	Load	Bind	Haul	Total	Int.¼" Kerf Scale	Doyle-Scrib. Scale	Scrib. Dec."C" Scale	
Bd.Ft.			Bd.Ft.	Bd.Ft.	Bd.Ft.	Cu.Ft.						$	$	$	
60	4	16.8	1009	589	858	158	4.24	41.25	3.34	70.23	119.06	1.93	3.31	2.27	1.23
80	41	12.9	1022	677	894	155	4.24	30.25	3.34	70.23	108.06	1.73	2.61	1.98	1.14
100	58	10.6	1052	768	936	155	4.24	25.00	3.34	70.23	102.81	1.60	2.19	1.79	1.08
120	41	9.1	1088	834	979	158	4.24	23.00	3.34	70.23	100.81	1.52	1.98	1.69	1.04
140	27	8.0	1129	895	1032	162	4.24	23.00	3.34	70.23	100.81	1.46	1.84	1.60	1.01
160	20	7.3	1173	946	1078	166	4.24	23.00	3.34	70.23	100.81	1.41	1.74	1.53	.99
180	11	6.6	1220	1003	1125	172	4.24	23.00	3.34	70.23	100.81	1.35	1.64	1.47	.96
200	16	6.2	1267	1058	1172	177	4.24	23.00	3.34	70.23	100.81	1.30	1.56	1.41	.93
220	3	5.8	1314	1111	1218	183	4.24	23.00	3.34	70.23	100.81	1.26	1.49	1.35	.90
240	3	5.6	1361	1163	1265	188	4.24	23.00	3.34	70.23	100.81	1.21	1.42	1.30	.88
260	2	5.4	1409	1214	1311	195	4.24	23.00	3.34	70.23	100.81	1.17	1.36	1.26	.85

Cost Per Additional 1/2 Mile Haul: -

Log Size Int.¼" Scale	Cost Per M Bd.Ft.			Cost Per 100 cubic feet
	Int.¼" Kerf Scale	Doyle-Scribner Scale	Scribner Dec."C" Scale	
Bd.Ft.	$	$	$	$
60	.13	.22	.15	.083
80	.13	.19	.15	.084
100	.12	.17	.14	.084
120	.12	.16	.13	.083
140	.12	.15	.13	.081
160	.11	.14	.12	.079
180	.11	.13	.12	.076
200	.10	.12	.11	.074
220	.10	.12	.11	.072
240	.10	.11	.10	.070
260	.09	.11	.10	.067

FOREST SURVEY

Northern Rocky Mountain

Inventory Phase. The following interesting facts have been picked from the mass of forest inventory data recently compiled for the three northeastern Washington counties of Spokane, Stevens, and Pend Oreille. Seventy-three percent of the gross area of this unit is still classified as forest land. Of the 2,643,651 acres of forest land 20 percent still contains stands of sawlog size, 70 percent is covered with poles and reproduction, 4 percent is classified as non-commercial rocky and sub-alpine and 6 percent is deforested. It is interesting to note that though cutting and fires have exploited the unit for over sixty years only 160,253 acres or 6 percent of the total forest land area have been actually deforested.

Ponderosa pine is the most widely distributed type within the unit. The acreage within this type makes up 47 percent of the total. Western white pine has 13 percent, larch-Douglas fir 32 percent and all other types 8 percent. Seventy-eight percent of all the producing forest land within the three counties is within zone 1 of accessibility, 19 percent is in zone 2, and only 3 percent is in zone 3. Sixty-four percent of the producing forest land is in private ownership, 16 percent is owned by the state and county governments and the remaining 20 percent is in federal ownership.

Though there still remains 517,530 acres of timber of sawlog size, it is scattered and the volume per acre is light. Fifty-six percent of all the acreage in stands of sawlog size is privately owned but the bulk of this timber is in the hands of the small owner. The volume figures for the northeastern Washington unit are not yet available. The average annual cut within the three counties, however, is 301,599 M feet log scale. Sawlogs make up 53 percent of the annual depletion by cutting, and fuelwood 36 percent. Poles, piling, hewed ties, shingles, pulpwood and fenceposts make up the remainder of the products cut.

A compilation for Spokane County alone showed the amazing total of 375 million feet log scale in scattered merchantable trees in immature stands. The bulk of this volume is in ponderosa pine. The average stand per acre is less than 1500 feet. This scattered volume is a substantial contributor to the fuelwood and farm timber requirements of the county.

County reports giving the forest statistics for Spokane, Stevens, and Pend Oreille should be available for distribution next month.

Growth Phase. Considerable interest has been evidenced concerning relative growth rates of larch-Douglas fir and western white pine stands.

Northern Rocky Mountain (Continued)

With completion of basic charts and tables for the normal larch-Douglas fir yield study these comparisons are readily made. The following table shows corresponding values for both species by given age and site classes.

Comparative mean annual board-foot increment per acre (Scribner rule), western white pine and western larch-Douglas fir.

Age	Site Class									
	I		II		III		IV		V	
	W.P.	L-DF	W.P.	L-DF	W.P.	L-DF	W.P.	L-DF	W.P.	L-DF
40	5	8								
50	34	33	8	13		3				
60	88	66	32	31	6	10				
70	155	104	71	53	20	22	5	4		
80	221	145	114	75	41	34	15	8	3	2
90	285	189	163	99	68	46	27	13	9	3
100	322	223	206	125	98	57	42	19	17	5
110	340	238	236	150	121	69	58	24	25	6
120	344	247	251	166	137	80	68	29	32	8
130	341	250	256	179	145	91	74	33	37	9
140	336	252	257	187	149	103	76	38	40	10
150	322	253	253	190	149	114	77	42	40	11
160	309	252	245	192	145	121	78	46	40	12

The above values are taken from the application tables constructed for the purpose of predicting yields on average well stocked areas.

Analysis of the differences in growth rates in the above table shows that stands in the western white pine type will outgrow stands in the western larch-Douglas fir type by 20 percent on sites I, II, and III, and by more than 50 percent on sites IV, and V. This may be due to the influence of several factors that affect the relative yields of white pine and larch-Douglas fir. The most important of these are:

(1) The presence of more favorable growing conditions in western white pine type.

(2) The individual trees in white pine type have better form class.

(3) Greater heights for given diameters are attained by white pine.

The most important deduction to be made from this comparison is that the western white pine sites on the whole will produce higher yields than those of western larch-Douglas fir.

Northern Rocky Mountain (Continued)

Complete yield tables and charts are being prepared for stands in the western larch-Douglas fir type and will soon be available for distribution.

Pacific Northwest

East Side of Oregon and Washington. The 1-inch-to-the-mile type maps for Wallowa, Grant, and Umatilla Counties were completed during February. Type maps are available now for all forested counties in Oregon and Washington. Final copies of the 1/4-inch-to-the-mile lithographed type map of southeastern Oregon, the sixth of the series of eight, were received and distributed. Many letters of appreciation of these maps are received daily.

Service Work. An increasing amount of time is being devoted to the many requests for statistical and map data. The demand for the lithographed type maps of the earlier quarters published is still active.

An exhibit of Forest Survey material was prepared at the request of the Northwestern Electric Co. for their large display window in the heart of downtown Portland. The lithographed maps were mounted to form a complete map of Oregon and Washington, the only blank areas being northeastern Washington and northeastern Oregon. Other material in this display includes a couple of county type maps, photographs illustrating types, and statistical publications. This exhibit of the products of the Forest Survey is attracting much attention and will probably be in place two weeks or more.

Southern

Sawtimber and Cordwood Volumes in Central and Southwestern Mississippi - Release No. 24. The manuscript for Mississippi Unit No. 3 was completed in February. This unit includes Jackson, Meridian, and Natchez, and has a total area of 10,799,500 acres, of which 6,030,300 acres, or 56 percent, is forest. Second-growth stands predominate; only 13 percent of the forest is old-growth and less than 5 percent is clear-cut and reproduction. Approximately two-thirds of the forest is in the pine and the pine-hardwood types; one-third is in the hardwood type. Wood resources are as follows:

Species-group	Bd.ft.(Doyle)	Cords (incl.sawtimber)
	thousands	
Loblolly, shortleaf and shortleaf pine	6,191,300	32,220
Gum, cottonwood, magnolia, etc.	2,243,800	15,065
Oak, beech, hickory, etc.	2,988,400	18,961
	11,423,500	66,246

Southern (Continued)

With approximately 661 sawmills, this is one of the most active lumber producing units in the South. Most of the mills are small; only 14 sawmills have a daily capacity of 40 thousand board feet or more, and only 65 have a capacity of from 20 to 39 thousand. There are no pulp mills here, but those located outside at Laurel and Pascagoula, Miss., and at Bogalusa, La., are taking large quantities of wood from this area.

FOREST INFLUENCES

California

San Dimas Experimental Forest. Two major storms and one smaller one have occurred this month, bringing the total rainfall at Tanbark Flat to 34 inches, with more than 40 inches at Fern Canyon. Each of the large storms (one on February 5 and 6, and the other on the 13th and 14th) produced 4 - 5 inches of precipitation, with little or no snow in the higher parts of the Forest. As a result, most of the snow had disappeared from southerly slopes at Fern Canyon, when the third storm deposited a foot of new snow in that area. This storm, on February 24 - 25, produced 1 - 1 1/2 inches of rain.

While none of these storms produced high peak run-off, all of our streams are continuously high enough to produce an unusually high water yield. Over 800 acre-feet are stored behind San Dimas Dam, and a considerable quantity has been released to Puddingstone reservoir. Release of water has also already been started from Big Dalton reservoir, and the Big Dalton spreading works are being used for the first time in years.

A two-foot steel San Dimas flume, installed at the San Dimas West Fork gaging station (#VII), has been giving an excellent record all this season. Use of this type of flume in the downstream ends of our large flumes promises at last a reasonable solution of our problem in measurement of flows containing bed-load.

About 1100 feet of the 1500-foot lysimeter fence have been installed. Collector tanks are all in place in the lysimeter tunnel, but not yet connected to the lysimeters. Erosion control on the cut slope northeast of the lysimeter site is progressing, with about 1/3 of the wattled area completed.

In the laboratory, mechanical analysis of soil eroded from SRE and WEC plots is now well under way.

Central States

Flood Control. On February 5-6 Baker represented the Forest Service at a flood control meeting of the Council of State Governments held in Columbus. Arthur Ringland of the S.C.S. attended as a representative of the Flood Committee of the Department of Agriculture. Action was taken to organize the Ohio Valley states for a flood control program.

During the first week in February, Kellogg accompanied a party from the office of Motion Pictures, U.S.D.A., which was taking shots of the flood damage during latter stages of the Ohio River flood. On tributaries in southeastern Ohio relatively little damage was apparent over wide areas. Within certain localities many land slips were initiated on steep slopes. These began apparently from the soil becoming so saturated with rain that the soil was of the consistency of mortar, and unstable on steep slopes. Grass cover was no deterrent to the soil oozing down the slopes, creating abrupt lines of breakage 1-3 feet deep on the upper ends and bulging matrix of sod and soil on the lower ends.

Disposition of sand bars was noted along the Muskingum River where deposits 1-3 feet deep were seen near the river over limited areas. Tree growth along this river's banks was badly battered and in places decapitated or else flattened by the force of current and floating debris. Kellogg returned at the end of the month to take still shots of some of these damages.

Lake States

Erosion and Streamflow. A new conception of the value of forest cover in the control and mitigation of floods was presented by C. G. Bates before the Minnesota section of the Society of American Foresters. Bates showed that forests by inducing percolation had a definite measurable value for protection--a value which could be compared directly with the cost of constructing storage reservoirs. Such valuation might be used as the basis for subsidizing private forest owners in order to induce them to keep their land covered with good timber growth.

Pacific Northwest

Flood Control Hearing. One joint public hearing on flood control by the Departments of War and Agriculture was held during the month, namely, that for the Willamette Valley project, a gigantic downstream engineering plan upon which the War Department has been working for some years. This meeting in Salem was attended by a representative audience of about 450 residents of the valley, from the Governor to the humble farmer whose land is being eroded away. Colonel Robins presided while the downstream engineering features

Pacific Northwest (Continued)

were being considered and then turned the meeting over to Director Munger for consideration of the land management aspects of flood control.

Rocky Mountain

Vegetation Type and Erosion. During the course of a recent forage resource survey of the national forests in Colorado and Wyoming detailed data on erosion conditions were recorded for each transect established. Compilation of this information has brought out relationships which are of considerable value in developing and comprehending the erosion situation on national forest land in these two states.

For example, the most seriously eroded plant type encountered was the foothill brush lands where accelerated erosion was present on 93 percent of the transects. Less severely eroded (in descending order) were the pinon-juniper, ponderosa pine-Douglas fir, sagebrush, spruce-fir, bunch grass, mountain meadow, alpine, lodgepole pine and aspen types. Most of the erosion occurring in the last few types was an incipient form of sheet erosion.

The relationships of erosion to plant density was very obvious. No accelerated erosion, however slight, was recorded where plant densities exceeded 30 percent. As density decreased erosion increased. Sixty-three percent of the transects with plant densities 5 percent or less were characterized by accelerated erosion. These erosion figures are compiled irrespective of plant type because of lack of numbers of observations. Indications are, however, that for each plant and soil type and slope there is a minimum plant density above which accelerated erosion does not occur. This density may vary from 10 percent in the short grass type on gentle slopes to 30 percent in the bunch grass type on steep slopes. Until these minimum densities can be ascertained it is not known how much virgin conditions can be modified before accelerated erosion will take place.

Southern

Road Bank Control. Inspection of the recently established road-bank-control study at Holly Springs revealed a good catch of several winter cover-crop plants and establishment of an excellent protective cover on plots receiving this treatment. Abrauzzi rye, hairy vetch, and Austrian winter peas make up most of the winter cover, burr clover and barley not having started growth as yet. Striking differences in growth were noted between fertilized and unfertilized plots, cover development on the former being greatly superior. Additional plantings to complete the establishment phase of this study will be made during this coming April and May. A working plan for a supplementary study comparing establishment and effectiveness of 32 promising erosion-

Southern (Continued)

control species for road-bank fixation was prepared during the month but this study, scheduled for initiation this coming spring, will probably have to be deferred owing to inability to get sections of banks graded and prepared for planting by that time.

Water-Cycle Studies. Observations in connection with the water-cycle studies on the Irons Fork Experimental Forest in Arkansas were further delayed as a result of two disastrous ice storms during January which blocked roads and trails with masses of down timber, damaged run-off plot equipment, and in some cases so changed the density and character of the stand that certain plots are having to be relocated. The masonry cross-sections established in Nesbitt Creek to provide permanent channel control for gaging purposes have stood up well under high stages of flow and no damage to channel improvements has occurred from flood-transported boulders. Stilling wells have been installed at the Nesbitt Creek gaging stations in readiness to measure stream discharge at these locations.

FOREST PRODUCTS

California

Walnut Veneer. A visit at the Station by Mr. Koehler of the Forest Products Laboratory made the occasion of a trip for him with Mr. Hill to Chico, California, to see what could be learned about the production there of the walnut which is known in veneer as Claro walnut. Mr. Koehler was concerned with complaints reaching the Laboratory in respect to a peculiar checking of the figured veneer stock from this species. This Station had also had more or less correspondence with the American Walnut Manufacturers Association at Chicago in regard to the identity of this species.

We were fortunately able to see some of the logs being shipped from Chico. The fact that the trees were leafless at this time of year introduced some difficulties in respect to identification. Some of this walnut at least is undoubtedly the variety Hindsii of the native Juglans californica. The walnut shipper with whom we talked says that the only different walnut shipped from there is trees of the eastern black walnut which have been planted here and there throughout the valleys of California. It would not seem that this eastern black walnut planted in California should be so changed in wood characteristics as to raise any difficulties in its identification by veneer workers. The question raised by the Association as to whether there were two varieties of the Claro walnut still remains to be answered. The logs which we inspected showed a beautiful figure due to wavy grain, but Mr. Koehler was unable in the casual field examination to detect any interlocked grain which he says usually distinguishes the Claro walnut.

Northern Rocky Mountain

Match Plank Lumber Grades. Match plank cut from western white pine is graded on the basis of characteristics which make it suitable for the manufacture of matches. And this brings up the question: What grades of commercial lumber are represented in a thousand board feet of match plank? The answer is given in the following table:

Proportionate amount of commercial grades represented in a thousand board feet of match plank, from Idaho white pines of different diameters

Diameter breast high class	Selects	Common					Other Grades	Total
	Quality (D) & Btr.	Colonial (No.1)	Sterling (No.2)	Standard (No.3)	Utility (No.4)	Industrial (No.5)		
inches	percent	percent	percent	percent	percent	percent	percent	
10-13	7.7	22.2	64.4	0.9	4.8			100
14-16	7.9	10.6	60.6	16.0	4.8		0.1	100
17-20	8.8	9.5	62.7	17.8	1.1	0.1		100
21-24	8.8	5.5	56.3	28.6	0.1		0.7	100
25 & up	9.5	2.0	43.5	37.8	4.7	0.3	2.2	100
Weighted average	8.9	5.9	53.6	27.8	2.7	0.1	1.0	100

The points to note in the table are: (1) that match plank consists largely of the sterling and standard grades; and (2) that the match plank cut from small trees consists of better grades of commercial lumber than the plank cut from large trees.

Pacific Northwest

New Process for Destructive Distillation. Among the interesting and promising developments in wood utilization is a new destructive distillation process now being demonstrated on an experimental scale in Portland. Natural Processes, Ltd., represented by Mr. M. P. P. Riis, conducts complete distillation of Douglas fir wood at temperatures not exceeding 400°F., in 15-20 minutes. In a demonstration watched by Andrews and Lodewick, 1 1/2 pounds of wood yielded 3/10 pound of charcoal, 7/8 pound of pyroligneous acid and approximately 6 cubic feet of a high B. t. u. gas. The demonstrator attributes the high yields at such low temperatures to the introduction of pulsations or oscillations into the retort and gas columns.

Log Depletion in Eastern Washington. For the purpose of the Forest Survey, county log depletion for the period 1925 to 1935 is being compiled for eastern Washington. Later similar information will be worked up for eastern Oregon.

Pacific Northwest (Continued)

Northern Pacific Land Indemnity Case. For the purposes of the Government in the suit of the Northern Pacific for reimbursement for unselected indemnity land in western Washington, statistics are being compiled showing annual log production in this region for the period 1920 to 1935, also the rated sawmill capacity for the same period. Information is also being compiled as to prices and consumption during this period.

Mill Studies. The time studies conducted in small Douglas fir mills during the past few years are being subjected to analysis, preparatory to developing a work plan for relative efficiency studies in this type of mill.

RANGE MANAGEMENT

California

Advisory Committee Meeting: San Joaquin. Highlight of the month was a meeting of the local advisory committee on February 19 at the San Joaquin Experimental Range. In addition to the formal committee, consisting of the local Farm Advisor, the President of the Madera County Sportsmen's Association, the President of the Madera County Cattlemen's Association, the Supervisor of the adjoining national forest, the local Ranger, State Division of Forestry, and four local cattlemen, the following cooperators and colleagues were present: C. B. Hutchison, Dean of the California College of Agriculture and Director of the Experiment Station; W. L. Howard, Director, Branch of the College of Agriculture at Davis; W. M. Regan, Prof. of Animal Husbandry, U.C.; G. H. Hart, Head of the Division of Animal Husbandry, U.C.; H. R. Guilbert, Associate Animal Husbandman, U.C.; Kenneth Wagnon, resident animal husbandman, San Joaquin Experimental Range; E. Bogart, U.C. animal husbandman stationed at Tulare; Ben Glading, biologist on the quail study, San Joaquin Experimental Range; F. P. Cronemiller, Chief, Division of Range and Wildlife Management, Regional Office; and E. E. Horn, Biologist, U.S. Biological Survey. The Station was represented by Superintendent J. W. Nelson, W. M. Talbot, and H. H. Biswell.

This annual midwinter meeting acquainted the local advisory committee with the research program under way and provided a forum for informal discussion of points of interest to local groups within the territory of influence of the Experimental Range. Following a field inspection of the forage plant nursery, the run-off installations, and the rodent plots, the accomplishments of the Experimental Range during the past year were presented and plans for the coming grazing season were outlined. Superintendent Nelson led the discussion of the pending additional land purchase and of a possible supplemental mountain range. Nelson, Cronemiller, and Glading (Biologist Horn being

California (Continued)

ill and unable to participate in the discussion) described the "4-way" quail study, in which the Division of Zoology, University of California, the U. S. Biological Survey, and the administrative and research branches of the Forest Service are cooperating. Mr. Cronemiller discussed the 1937 AAA program from the standpoint of Forest Service participation.

Pacific Northwest

Succession on Grazed Douglas Fir Cut-Over Lands. A study of grazing use of Douglas fir cut-over lands has been under way at this Station since 1925. This was summarized in 1927 by Douglas C. Ingram and published in the J.A.R. under the title, "Vegetative Changes and Grazing Use on Douglas Fir Cut-Over Land". The field work of both natural regeneration and vegetative change has been kept up to date by the Section of Silviculture. The project is now being taken over by the Section of Range Research and an analysis of data of plant succession is under way.

MANUSCRIPTS

CALIFORNIA

Brown, A. A.	Design of national forest transportation plans to meet the fire control problem in northern California. (For Jour. of For.)
Brown, A. A.	Design of transportation plans to meet the fire control problem in southern California. (For Jour. of For.)

LAKE STATES

Gevorkiantz, S. R. and Duerr, W. A.	A yield table for northern hardwoods in the Lake States. (Jour. of For.)
Mitchell, J. A.	The rating of forest fire danger. (Submitted to Michigan Academy of Science, Arts and Letters.)
Rudolf, P. O.	Diagnosing plantation mortality. (Submitted to Michigan Academy of Science, Arts, and Letters.)
Shirley, H. L.	Direct seeding in the Lake States. (Submitted to Jour. of For.)
Stoeckeler, J. H. and Baskin, L.	The Denbigh disc scarifier, a new method of seed treatment. (Submitted to Jour. of For.)
Zon, Raphael	Can floods be controlled? (Submitted to Forestry News Digest.)
Zon, Raphael	The farm woodland - a neglected resource. (For Mimeographed Series of Univ. of Wisconsin.)

NORTHERN ROCKY MOUNTAIN

Weidman, R. H.	Racial influences in 25-year test of ponderosa pine. (For Dept. Pub.)

NORTHEASTERN

Kraemer, J. H.	Suggestions for silvicultural measures in old field spruce-fir stands in the northeast. (For Jour. of For.)

Manuscripts (Continued)

PACIFIC NORTHWEST

Brandstrom, A.J.F. and Richen, C. W.	Memorandum regarding an analysis of experimental light cutting on the Hines sale area, based on Payne's recruise of the 10,000-acre area.
Brandstrom, A.J.F. and Carlson, R. C.	Memorandum regarding results of light selective cutting on the 10,000-acre experimental area, based on log grading on the mill deck.
Lodewick, J. E. and Anderson, Eric A.	Anaconda paste on Forest Service poles in Region 6. (Office report.)

ROCKY MOUNTAIN

Burke, H. D.	A new profile gauge. (For Jour. of For.)

SOUTHERN

Craig, R. B.	Land ownership, taxation, and tax delinquency in Survey Unit #1, Georgia, 1934. (Typewritten, January 18, 1937.)
Craig, R. B.	Land taxation and tax delinquency in Survey Unit #1, Florida, 1934. (Typewritten, January 8, 1937.)
Harper, V. L. and Bickford, C. A.	Slash pine has high qualifications. (For Gamble's Naval Stores Yearbook.)
Liefeld, T. A.	Naval-stores yields from bark-bars.
Pessin, L. J.	The effect of vegetation on the growth of Pinus palustris seedlings. (Typewritten, February 4, 1937.)

IN PRINT

Andrews, H. J.	What the Pacific slope forests now have and are now growing in relation to national supplies and demands. (Jour. of For. Feb. 1937.)
Brandstrom, Alex J.F.	The role of selective cutting in promoting sustained yield, with special reference to ponderosa pine. (Jour. of For. Feb. 1937.)
Baker, Willis M.	Reforestation problems in the Central States. (The Indiana Farmer's Guide Feb.27, 1937.)
Chapman, A. G.	An ecological basis for reforestation of submarginal lands in the central hardwood region. (Ecology, Jan., 1937.)
Demmon, E. L.	Economics for our southern forests. (Occasional Paper No. 59, Feb. 23, 1937.)
Lemieux, F. J.	Management and utilization of southern hardwoods. (Southern Lumberman, Feb. 15, 1937.)
Lodewick, J. E.	Shipments of cascara bark by water from Oregon and Washington, 1936. (Multilighed.)
Morris, Wm. G.	Fall precipitation comparison. (West Coast Lumberman, Feb. 1937.)
Munger, T. T. and Morris, Wm. G.	Growth of Douglas fir trees of known seed source. (U.S.D.A. Tech. Bul. 537, Dec. 1936.)
Roe, E. I. and Rudolf, P. O.	A new station for hemlock in Minnesota. (Torreya, 37, Feb. 1937.)
Scholz, H. F.	Diameter outside bark as an index of bark thickness at breast height for red and chestnut oak. Black Rock Forest Papers. Vol. 1, No. 3, January, 1937.
Shirley, H. L.	The relation of drought and cold resistance to source of seed stock. (Minnesota Horticulturist, Feb. 1937.)

TRANSLATIONS

No. 266. Transpiration of cut leaves, by W. Holz. From Angewandte Botanik 17(6), 1935. Translated (German) by M. Mok, July, 1936.

No. 267. Comparative thinning experiments of pines, by G. Baader. From Allgemeine Forst- Und Jagd-Zeitung, Vol. 110, 1934. Translated (German) by M. Mok, September, 1936.

No. 268. Research on evaporation from natural soils, by M. Helbig and O. Roessler. From Allgemeine Forst- Und Jagd-Zeitung, 1921. Translated (German) by R. G. True, July 1934.

No. 269. Water consumed by forest trees in relation to forest-meteorological conditions, by Franz R. v. Hoehnel. From Forschungen Auf Dem Gebiete Der Agrikultur-Physik, Vol.2, 1879. Translated (German) by M. Mok, December, 1936.